UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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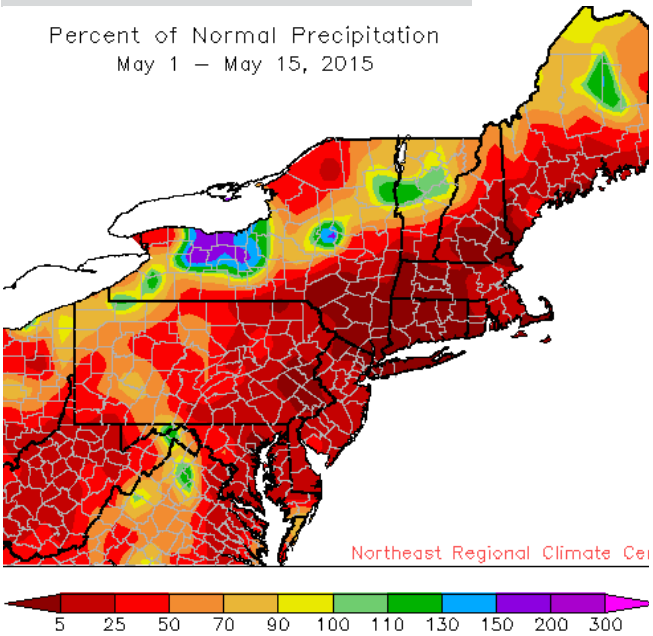
In this issue:

Crop conditions

From winter to summer in about 2 weeks—that was our 'spring' this year. Dry, hot conditions with strong gusts of wind and a sprinkling of occasional frost has been our lot these last few weeks. In unirrigated fields, seedlings are struggling! Some are getting wind whipped as they are transplanted, and others are drooping for lack of water. Farmers with irrigation were seen across the state watering fields merely to lay plastic, and irrigation trucks are out continuously to water the establishing crops. The 1/5-1/4 inch of rain we received on Tuesday of this week was not much, but just enough that many were out the day before making herbicide applications before the light rain to water them in. Many without irrigation are waiting for rain to transplant their cucumbers, summer squash, zucchini, tomatoes, peppers and eggplant, but others were able to get the plastic down and plenty of water in the transplant holes that they felt safe putting plants in the ground. One upshot of this dry weather has been that many farmers were able to get into wet fields early this year, mixing up crop rotations by planting early things in fields that normally don't get used until summer. With just enough moisture in these typically wet fields germination can be good; parsnips reported up in 2 weeks and beets in 5 days. Corn is up and looking good. Customers at farmers markets and roadside stands were confused by the lack of produce available when it feels like July most days. It's easy to forget that we still had snow on the ground in a few locations a mere month ago! Tell them to be patient, summer will be here soon enough.



The Northeast Regional Climate Center shows MA is experiencing just 0-25% of our normal precipitation this month. http://www.nrcc.cornell.edu/#

Pest alerts

Scouting data for Pest Alerts is being collected regionally this year, from farms in Rhode Island, Vermont, and Massachusetts thanks to funding from the Northeastern IPM Center. Additional reports come from Extension Educators who scout on farms in NY and NH. When not given here, refer to the New England Vegetable Management Guide for scouting thresholds and treatment options.

Allium: Onion maggot flies have emerged, but have not reached peak flight in any of the locations in Table 1. Yellow sticky card traps placed in a field in Worcester Co. MA captured only 5 adults over the last 2 weeks. Onion fields were scouted in the following counties and no eggs were found: Chittenden, VT; Franklin, Hampshire and Worcester, MA; and Washington, RI. Place yellow sticky cards in fields now to monitor peak flight at 700 GDD (base 40° F) then scout for eggs and maggots by scratching gently around the plant roots with a pencil. Preventative soil insecticide applications are recommended for the control of first generation larvae if damage from the previous year's crop exceeds 5 to 10%. Monitoring now will help to determine if preventive treatments, including use of row covers, are warranted in future seasons.

Brassicas: Cabbage Maggot: All locations reported in Table 1 have exceeded peak flight of the overwintering generation. Flies were captured on yellow sticky cards in brassica fields in Franklin Co, MA and Worcester Co, MA. Eggs were scouted above threshold (average of 1 egg per 25 plants scouted) in cabbage, bok choy and kale fields in Franklin and

Hampshire Co, MA (5eggs per plant). In the warmer conditions of a greenhouse, maggots have been reported in broccoli transplant trays causing damage. A new material (Verimark) is available for transplant and field drench applications and has systemic activity. In trials conducted at UMass in 2014, this material provided excellent control. In the field, floating row covers provide an effective barrier against this pest provided the adults are not emerging from overwintering pupae in soil that had brassicas last year. Avoid damage by planting after first flight is over, or 700 accumulated GDD's (base 40°F). Drought conditions now may cause transplants to look like they have maggot damage, so be sure to scout for eggs before making any treatments.

Table 1. Accumulated Growing Degree Days (Base 40° F) and % emergence as of 5/20/15 for Cabbage and Onion Root Maggot. Values based on NEWA Maggot models.

Location	Accumulated GDD's (40° F)	Cabbage Maggot Emergence[y]	Onion Maggot Flight Peak[z]
South Deerfield, MA	646	87%	< 1st Peak
Ashfield, MA	591	78%	< 1st Peak
Waltham, MA	660	90%	< 1st Peak
Seekonk, MA	695	95%	< 1st Peak
Middletown, RI	615	82%	< 1st Peak
Burlington, VT	647	88%	< 1st Peak

Adult emergence from overwintering pupa:
[y] Cabbage Root Maggot 1st emergence = 288 GDD, 25% = 366 GDD, 50% (Peak) = 452 GDD, 95% = 687 GDD
[z] Onion Root Maggot 50% emergence (Peak) = 700 GDD

Cabbage root maggot egg on a pencil tip (top) maggots (middle) adult (botton)

Flea Beetle: Both striped and crucifer flea beetles have been observed causing injury to young cabbage seedlings in in Franklin Co., MA, on multiple brassicas in Washington Co., RI and on greenhouse pak choi in Chittenden Co., VT. While they have a preference for non-waxy *Brassica rapa* species such as pak choi and arugula, even the waxy brassicas are susceptible to this pest, especially early in their growth. Spunbonded row covers provide excellent protection if well sealed at the edges. Rotate spring crops as far as possible from last season's fall brassica crops and try to locate fall plantings as far from early successions as possible. A working threshold of 1 beetle per plant or >10% average leaf damage on 50% of the plants has proved effective in leafy greens and early stages of heading brassicas. See article this issue for more on managing flea beetle.

Sweet Corn: Pheromone traps have been set up at 25 locations in New York state, and one **European corn borer** E strain (NY) was captured in Ontario Co., NY. You know what that means? Set out your corn traps, especially for sweet corn started under plastic, and order *Trichogramma*! Releasing *Trichogramma ostriniae*, the tiny wasp that parasitizes the eggs of European corn borer, can reduce or eliminate the need for pesticide sprays to control this pest. To ensure that you will be able to receive *Trichogramma* this year you must call IPM labs as soon as possible. The wasps are custom-reared based on pre-orders, so let IPM labs know your needs well in advance. When placing your order, have the number of acres in which you plan to release and the size and number of plantings you have for early corn. *Trichogramma* can also be ordered for later-season releases to control second generation ECB in sweet corn and fruiting bell peppers. *Trichogramma ostriniae* can be ordered from IPM Laboratories; Locke, New York; 315-497-2063; ipminfo@ipmlabs.com

Chard and Spinach: Leaf miner eggs and maggots were found in Washington Co., RI, Bristol Co., MA, and Hampshire Co., MA. Scout your fields now by inspecting the undersides of leaves and treat when egg masses are observed, in order to target them before they hatch. Be sure to adjust spray nozzles to access the undersides of leaves as that is where the eggs are found, and add a spreader/sticker to the mixture in order to get better coverage. Avoid planting spring crops near

Leaf miner eggs (left) maggots (right)

tunnels where winter spinach was grown. Control weed hosts including lambsquarters, nightshades, chickweeds and plantains. Row covers protect the crop by excluding flies, but scout for eggs on transplants before covering. Some systemic insecticides are registered that may be applied to transplants or to the soil. Among organic products, spinosad has demonstrated efficacy when applied before egg hatch.

Cucurbits: **Striped cucumber beetle** has not yet be observed, but preventive actions can be taken now, as the adults will be emerging soon from field edges and your young seedlings will be at risk. Spunbonded row covers exclude beetles: use hoops to prevent abrasion and remove at flowering to allow pollination. Transplanted crops reach a later growth stage before beetles arrive than direct-seeded crops, giving them a leg up over this pest and the associated disease it vectors, bacterial wilt. Some repellents or systemics may be applied to transplants outside the greenhouse before setting in the field, which is convenient and allows lower rates of application.

Tomatoes: **Powdery mildew** was reported this week in high tunnel seedlings in Washington Co, RI. Low light and cool temperatures are the optimum conditions for this disease, therefore, early spring greenhouse and high tunnel plantings are particularly susceptible.

Multiple: **Wireworm:** Was found feeding on roots of cabbage in a field in Franklin Co, MA and in a field to be planted in corn in NH. Wireworms often cause damage on potato and may now be feeding in freshly-planted potato seed pieces. During extended hot, dry weather, such as we are having now, wireworms may seek out the potato tubers for moisture and food. Fields high in organic matter, recently plowed, previously in sod or pasture, or planted with grass cover crops, or low spots are more prone to high wireworm densities. Avoid planting in these fields if possible. In NH, a farmer saw very high numbers of wireworm while plowing a field previously planted with daikon (Tillage Radish) and winter rye, without having to get off the tractor! The farmer is now reconsidering his plan to plant sweet corn in that field.

Garden Springtail: was spotted in a greenhouse in Burlington, VT on pak choi, in Bristol Co., MA on Napa cabbage, and was also reported on seedlings of multiple crops in MA. This tiny 1/16" blue gray (sometimes orange) insect produces shot holes in young leaves of many vegetable crops which resemble that of flea beetles. They also spring off of plants as flea beetles might. Populations tend to be high in fields high in organic matter, with reduced-till systems, and with soils that crack when drying. Use clean cultivation and spot-treat areas where damage occurs. Most broad-spectrum insecticides registered for cutworms or leafhoppers will also control springtails.

FLEA BEETLE MANAGEMENT

Flea beetles have emerged from their overwintering homes in the shrubby or wooded areas surrounding fields and begun to feed on the first spring brassica plantings. Controlling flea beetles can seem like a losing battle, but we have seen real success on farms that have taken an integrated approach to management. The most important steps to reducing the population size and damage caused by flea beetles seem to be breaking the cycle (rotating spring crops as far as possible from overwintering sites near last years' fall crop), and controlling early season outbreaks using something like a trap crop or a "push-pull" approach to prevent the problem from spiraling out of control within the season or from building up to un-manageable levels over the years.

Life Cycle. The crucifer flea beetle (*Phyllotreta cruciferae*) is uniformly black and shiny, while the striped flea beetle (*Phyllotreta striolata*) has two yellow stripes on its back. Both are about 2 mm in length and hop away when disturbed. These flea beetles only feed on brassica crops; those found on corn or solanaceous crops are different species. Though they prefer the tender leaves of *Brassica rapa* & *B. juncea* crops such as arugula, tatsoi, mizuna, bak choi, and mustard, they will also feed on the more waxy Brassica oleracea crops such as broccoli, cabbage, kale and collard. Their feeding damage—small, round holes on leaves or leaf margins, which can coalesce to form large holes as leaves mature—can

destroy or delay maturity in seedlings and reduce yield and marketability of older plants. The adults in fields now will lay their eggs in the soil. Larvae will feed on the root hairs of brassica crops, pupate underground, and emerge as adults in late July to feed on fall brassicas before moving outside of the field for the winter.

Management:

Break the cycle. Plant spring crops far from fields where fall brassicas were grown, and where flea beetles will over winter. When overwintering beetles emerge, if they can't find a host plant they will not survive and reproduce and you will reduce the population of flea beetles on your farm. You can also starve the overwintering beetles by delaying planting until July. This may not easily fit your markets, but it does work. With no food or place to lay eggs, the overwintered adults leave the area, instead of reproducing and emerging in time for midsummer dining. It may take 2-3 years to bring populations down. Control weeds at the same time. The best protection for a spring brassica planting is isolating the crop from where the beetles would have overwintered, near last years' fall crop. Finally, separate your fall crop from the spring crop, since second generation flea beetles will emerge at the same time that fall cole crops will be at their most vulnerable. These second generation adults are also the beetles that overwinter, so next spring, plan to use a field distant from previous late-season brassica fields. After harvests, till crop residue immediately to uproot and kill underground larval populations.

Row covers. Floating row cover provides the most effective protection from flea beetles, especially in spring and early summer. It is expensive in both materials and time, but it works. It is critical to seal the edges immediately after seeding, because brassica seeds germinate quickly and beetles rapidly find the cotyledons. Flea beetles can fit through small openings – not to mention the large holes and tears that often develop in row cover over time. Edges of the cover must be sealed on all sides using soil, black plastic bags filled with soil, or some other method. Fortunately hoops are not needed on brassica crops, but management is still time-consuming because the cover has to be removed for cultivation. Replace it as soon as possible to avoid letting beetles in.

Other insect barriers, such as Proteknet, Biothrips, and Filbio, are available in a range of mesh sizes and can be used to protect against a variety of pests, including flea beetles. These provide less heat and greater air circulation than spunbonded row covers, though for early spring crops, the additional warming benefit of traditional row covers of various weights may be preferred.

Chemical control. Maturing plants should be scouted frequently. When plants are young, an average of 1 beetle per plant or 10% average leaf damage is a reasonable threshold for chemical intervention. Several synthetic pyrethroids (Group 3A), carbamates (Group 1A), neonicotinoids (Group 4A, either as foliar or soil drench), and the relatively new diamide class (Group 28) are labeled for flea beetle in brassicas. Avoid repeated use of one type of chemistry over multiple generations or using both soil and foliar applications of the same group. Note that as of 2012, the registration for Thionex has been cancelled and is no longer allowed on cole crops. Soil-applied systemic insecticides, such as Admire Pro and Actara can provide longer term control against damage, although beetles may still be seen when scouting. Products containing the new active ingredient cyantraniliprole, a diamide (Exirel for foliar applications; Verimark for soil), are labeled for flea beetle and have been shown in trials to have good efficacy against this pest. Be aware that systemic insecticides may have longer days to harvest intervals. With foliar sprays, even if good control was achieved, re-infestations can occur rapidly and may require additional sprays.

For organic farmers, the choice of chemistries includes spinosad (Entrust) and pyrethrin (Pyganic). In UMass trials, Entrust showed the greatest efficacy in suppressing flea beetles and reducing damage, while Pyrethrin (Pyganic EC 5) showed poor to moderate efficacy in our trials but is reported by growers to cause a significant short-term knockdown. Abby Seaman, NYS IPM, found in 2012 trials that both kaolin (Surround WP) and hot pepper wax worked well. They did not prevent enough feeding for salad greens to be marketable, but they did prevent enough feeding for broccoli, cauliflower, cabbage, etc. to outgrow the damage. In 2013 NYS trials, Entrust, as well as both Venerate and Grandevo, two OMRI-approved bioinsecticides, were all found to significantly reduce damage from flea beetle on cabbage under low pest pressure. Another promising organic product is Azera, a mix of azadirachtin and pyrethrins. A 2011 University of Maryland trial found that Azera significantly reduced flea beetle feeding damage, and that mixed with Surround, it both reduced feeding damage and maintained efficacy over time.

Control brassica weeds. Brassica weeds also harbor flea beetles (both adults and larvae) and reduce the efficacy of our crop rotation schemes that aim to break the pest cycle by changing crop families. Yellow rocket, wild mustard, and Shepherd's purse are familiar weeds that are widespread in fields and roadsides. The list of weed hosts probably also in-

cludes garlic mustard (Alliaria petiolata), a serious invasive weed in the brassica family. It is a biennial with white blooms in spring (May). It thrives in roadsides and field edges as well as shady woodlands, and has rapidly spread throughout Massachusetts. A good fact sheet on garlic mustard can be found at: http://www.nps.gov/plants/alien/fact/alpe1.htm or through the Invasive Plant Atlas of New England (IPANE) website.

Trap cropping. Take advantage of the flea beetle's preferences for particular brassicas by using the preferred species or varieties as a draw. Their numbers will build up in the more attractive plants, and are less likely to move into or stay in those less preferred. A border or even a middle row planted to Brassica rapa or B. juncea crops such as Komatsuna, tatsoi, mizuna, bak choi, and mustard has been shown to reduce numbers and feeding damage on less preferred B. oleracea crops such as broccoli, cabbage, or traditional kale (eg, Winterbor types). Red Russian kale (B. napus) and Lacinato kale (B. oleracea) seem to of intermediate attractiveness. To make it work, here's some tips:

- Make sure the trap crop is established before the main crop (the one you are trying to protect) or is at least as big (eg transplanted same day). Direct-seeded crops can be used around transplants if seeded 7-14 days earlier.
- Use a fast-growing, vigorous cultivar for the trap crop.
- Use a border crop to prevent beetles from moving farther into the field. Traps at end of rows help make a complete perimeter, which stops beetles coming from all directions. Interior trap crops also can act as a 'sink' within the field.
- Spray only the trap crop to kill the accumulated beetles, and avoid having to spray the main crop. You also want to keep the trap crop viable enough to do its work, and potentially be harvestable as well. Use a longer-residual product, if possible.
- Combine with a repellent on the main crop. Surround WP and garlic sprays can be used for this purpose.

A variation on this theme is the push-pull system, in which most of the brassica crop is treated with a repellent such as Surround, to "push" the beetles to a sensitive crop (e.g. bok choy or mustard), which is left untreated. This strategy limits the amount of time and material used in controlling the pest, since you only need to spray the "pull" crop, instead of all of the brassica acreage with an insecticide. The trick is to catch the beetles on the sensitive crop before they cause too much damage there, or make the "pull" crop something you don't intend to harvest, like an extra row of direct-seeded mustard. We saw this work really well on a farm in MA where flea beetles had built up to very high levels and were a major production challenge. When the farmers combined this strategy with crop rotation, separating spring from fall fields and going into a field that had been out of brassicas several years, the results were impressive. So there is hope!

Effect of push/pull system. Kale treated with surrounded is protected from damage (top and bottom) while untreated bok choy draws flea beetles where they can then be sprayed (hopefully before they cause this much damage!).

Resource: Hazzard, R. "Materials for Beating Flea Beetles in Brassicas". New England Vegetable and Fruit Conference, 2005 Conference Proceedings: http://www.newenglandvfc.org/2005_conference/sessions_05/biorantional_biological_pest_control/Materials%20for%20Beating%20Flea%20Beetles%20in%20Brassicas%20.pdf

--Updated by L. Mckeag and S. Scheufele, Umass Extension, Vegetable Program.

BACKPACK SPRAYER IMPROVEMENTS AND CALIBRATION

Backpack sprayers have many benefits; they are relatively inexpensive, so multiple sprayers can be used for different purposes, they are easy to maintain, and they can be very accurate because they are strapped directly to the applicator, unlike larger tractor drawn sprayers. Growers with diverse crops and small plantings often need to apply pesticide to beds or plots of only several hundred square feet, and backpack sprayers are the best tool for the job. John Grande and Jack Rabin of Rutgers made an excellent series of short videos on selecting, upgrading and calibrating backpack sprayers (http://snyderfarm.rutgers.edu/Backpack-Sprayers-Video.html). If you don't have time now to watch the videos, but would like

some help getting your sprayer ready for use in the field, then keep reading. First, a spray wand conversion costing about $200 can go a long way to improving the efficiency and usability of your backpack sprayer. An instructional video and parts list may be found at the end of this article. Next, follow the steps below for calibrating your back pack sprayer so that you can get out there and spray… after scouting, correctly identifying the pest, and selecting the appropriate materials of course!

Making an accurate and effective pesticide application will depend on four variables: a constant walking speed, a steady pressure providing a constant volume, maintaining your spray swath width, and selecting the most appropriate nozzle tip for the job. If you change any one of these, you change the amount of spray you apply.

Walking speed. This constant walking speed should be one that you can comfortably maintain over the entire time you intend to spray and in the uneven conditions of a cultivated field. It also must be the same speed at which you calibrate the sprayer. If you double your walking speed while maintaining pressure and swath width, you'll apply half as much material. You would then require twice as much pesticide per gallon (that is, a greater concentration) to apply the same amount of pesticide per acre. A barbed swivel added to the base of your spray wand will allow you to direct the angle of your spray, and allow you to walk through the field without fatiguing your wrist, making the entire process more comfortable. For most, a walking speed easy to maintain is 2-3 miles per hour (MPH), or, 34-23 seconds per 100 ft. 3 MPH also happens to be a good speed for tractor driven pesticide applications. You can easily practice this walking speed by marking out and walking 100ft. in the field and time yourself while spraying water to test your coverage.

Pressure and Volume. If you change the pressure while you spray, you change output. Increased pressure results in higher output; the exact relationship depends on your nozzle type. 30 psi is a common pressure used with backpack sprayers since 40psi is hard to achieve with a hand pump operated sprayer. Manufacturers provide output rates for nozzles at a given pressure; check out a catalog, you will quickly become a nozzle head geek! A pressure gauge can be fitted on to a backpack sprayer, however, adding a CF pressure regulating valve to the spray wand is the best option for maintaining constant pressure. With a CF valve, the sprayer will only spray when there is enough pressure in the tank to maintain a constant flow and will not exceed the flow wither, so, when the flow stops, the applicator knows that they need to pump more air into the tank in order to keep going. If you'd like to check your rate of output, then fill your tank ½ way, pump the sprayer, and determine your volume by collecting the spray output in a container while timing yourself hold the trigger for 1 minute. This will provide you with each nozzle's output in gallons (or whatever volume you choose) per minute (GPM).

Nozzle tip selection. The proper tip will depend on the situation. Tips are available that cover a wide range of output volumes, spray widths, and pressures. Most backpack sprayers come with a single flat fan nozzle, but a cone tip may be more appropriate for getting the small droplet size that is needed for covering foliage. When making soil drenches for root pests, some growers remove the nozzles entirely, because soil drenching usually requires more water per acre in order to carry the product into the soil in a narrow band along the row. For soil drench, labels frequently give amounts per 100 row ft. Many spray wands that come with the backpack sprayer do not have easily adjustable nozzles, therefore, it is important to retro-fit your wand with a quick change nozzle body adapter and round cap so that you can easily change and adjust nozzles.

Swath width/nozzle height. Tips are designed for use within certain heights and pressures. Within these ranges, some tips deliver narrow bands; others, like flooding tips, provide swath widths up to 7 feet. The wider each swath width, the less time the operator spends walking up and down fields. The height at which you hold the spray tip above the target influences the swath width. For foliar applications, 18" above the crop is a common distance appropriate for many nozzles. Keep this distance even if you are spraying from the side in order to improve coverage of lower leaf surfaces. Higher distances from the target plant surface will increase the band width but also the potential for pesticide drift. Determining the desired band width can easily be done on a dusty farm road with water in the sprayer then measuring the band width. If you have trouble maintaining the desired height, tie a piece of string weighted with a bolt 18" long (or the desired height) from the wand near the nozzle head, and watch that it just touches the ground as you walk.

Calibrating backpack sprayers:

First, check your sprayer coverage and operation. Select the spray tip or boom setup that provides the desired coverage. Add water, and spray the ground or dry pavement as if you were spraying your field. Check fittings and hoses for leaks. Check the spray pattern for uniformity to make sure none of the nozzles are clogged and that you are achieving proper spray pattern overlap with the boom. You can also check it over the crop to see if you are getting good coverage by attach-

ing water-sensitive cards to a piece of foliage and inspecting your spray coverage. (These cards are available from suppliers of spray equipment and pesticides.) Adjust nozzle spacing and/or height until you achieve the desired pattern. For insecticides and fungicides, your goal is to use sufficient water to cover the foliage with small droplets, but only until the point of drip off of leaf surfaces. Be certain you're getting uniform coverage before you proceed!

Follow these steps to calibrate your sprayer:

1. Calculate what portion of an acre is being sprayed. Determine sq ft of area to be sprayed (multiply canopy width x row length x number of rows). Calculate how much of an acre this is (this may be a small fraction of an acre):

Example:

4ft canopy width x 250 ft bed length x 5 rows = 5,000 sq.ft.

5.000 sq. ft / 43,560 ft2 per acre =

Acres to be sprayed = 0.115 acres

2. Calculate how much pesticide to use. Multiply the rate per acre for the crop and pest (from the label) times the proportion of an acre to be sprayed.

Example:

Pyganic 5.0EC at 10 fl. oz. per acre x 0.115 acres

Amount of Pyganic needed = 1.15 fl. oz.

3. Measure water needed per sq ft of crop. Add a known amount of water (eg 1 or 2 gallons) to the tank. Spray the water as if you were actually spraying your field and watch that your crop gets adequate coverage until water drips off the leaves, but not to drench the soil. When making a soil drench application, target the base of the plant and check if enough water is applied to percolate 2 inches deep. Remember, you must maintain constant pressure, constant walking speed, and consistent nozzle height and boom setup or wand motion to achieve the coverage you need. This amount will change with different crops and size of crop canopy. When the water is gone, stop and mark the spot. Measure the area you sprayed and calculate the square feet (length of swath x width). Calculate how many gallons needed per sq ft.:

Example:

2 gallons used / 1000 sq. ft. tested

Gallon per sq. ft. = 0.002 gallons

4. Determine total water needed:

0.002 gallons x 5,000 sq. ft (from step 1 above)

Gallons of water needed = 10 gallons

5. Mix the required amount of pesticide in the required amount of water. It is best to add half the water, add the pesticide, agitate, then add the remaining water. Spray, using the walking speed, pressure, nozzle and boom setup or wand motion that you used for calibrating. To speed up your mixing process, see the table below for commonly used labeled rates of organic insecticides converted into amounts per 100 and 1,000 sq. ft.:

Product	Amount per 100 sq ft	Amount per 1000 sq ft	Rate per acre
Pyganic 5.0EC	0.02 oz or 0.67 ml	0.23 oz or 6.7 ml	10 fl. oz
Entrust	0.014 fl. oz. or 0.4 ml	0.14 fl. oz. or 4.0 ml	6 fl. oz.
Surround WP	1 ½ - 3 cups	4.5 - 9 cups	50 lb

Note that the measuring device used must be accurate to 1/10 ml! For Entrust, do not use more than 3 gallons of water per 1,000 sq ft. Many pesticide labels require that no more than 2 consecutive applications are made and may give a maximum allowable amount of product per acres per season, to prevent or slow the development of resistance within pest populations.

You are now prepared to tackle your pest problems with an upgraded spray wand and an accurate calibration! Happy spraying, and don't forget your personal protective equipment (PPE).

Resources:

Hazzard, R. "Measuring Insecticide or Fungicide for Backpack Sprayers", University of Massachusetts Extension Vegetable Notes. Vol. 26:8

Landgren, C.G. Calibrating and Using Backpack Sprayers, Oregon State University, Washington State University, University of Idaho.

Stivers, L. "Upgrade and Calibrate to Optimize your Backpack Sprayer" Pennsylvania Vegetable Growers News,Vol.38: 3

Grande, J. and Rabin, J. Rutgers University, NJ. "Field Demonstrations: Backpack Sprayers" Video Series: http://snyderfarm.rutgers.edu/Backpack-Sprayers-Video.html

-- K. Campbell-Nelson, UMass Extension Vegetable Program:

FIELD HAND WASHING STATIONS

For both food safety and worker safety reasons, people working out in farm fields should be able to wash their hands on a regular basis—whether after contacting pesticide residues, using the toilet, or before and after taking a snack break. When running water in a bathroom or other facility is not readily available, portable hand wash stations should be provided. A portable hand wash station, which should be available in any fields that are more than ¼ mile from the nearest facility with running water, can be a fancy pre-made thing costing $500 or more, or it can be a very simple do-it-yourself design that can cost as little as $20 to put together (Fig.1). What is essential is that the station provides enough water for someone to wash their hands with soap and then rinse them, along with soap and single-use towels, and a place to throw the towels away. The University of Minnesota Extension has an excellent illustrated, step-by-step guide called How to Build a Field Hand Washing Station in 10 Easy Steps for Under $20, with accompanying video: https://youtu.be/SMa5OTa3PnU.

Fig. 1 A simple, inexpensive field hand-

Food safety certification programs like USDA-GAP and Commonwealth Quality require that bathrooms and hand washing facilities be accessible at all times to people working in the field (Fig. 2). Worker hygiene is also a major component of the new FSMA regulations. Additionally, the EPA Worker Protection Standards, with which all farms that use any kind of pesticide must comply, state that farm workers who may be exposed to pesticide residues – for up to a month after the pesticide's REI has ended – be provided with enough water for both routine washing and emergency eye flushing, along with soap and single-use towels for hand washing. Anyone actually handling pesticides must additionally be provided with enough water for washing their entire body, in the event that they are accidentally exposed to pesticides. Five gallons is an adequate amount of water to provide in most situations. This will allow workers to wash their hands several times. If a worker needs to wash out their eyes, 5 gallons will allow them to flush their eyes for about 15 minutes.

U-pick operations, and other farms that may have members of the public or other un-trained people in their fields and buildings should post clear signage regarding the need for hand washing and hygiene, and provide either a nearby restroom or field hand washing station.

-L. McKeag, UMass Extension, Vegetable Program

Fig. 2 Portable bathrooms can be purchased, or rented. Trailers allow you to easily relocate facilities. Credit: R. Bonanno

Upcoming events

Greenhouse Management Program for Vegetable Growers

When: Wednesday June 3, 2015 from 4pm to 6pm

Where: The Food Project in Boston

Join The Food Project, Eastern MA CRAFT and UMass Extension for a meeting focusing on greenhouse production. Topics will include fertility and pest management, with a presentation by UMass Extension Educator/Vegetable Specialist, Ruth Hazzard.

Farm Food Safety for Post-Harvest Handling and Small-Scale, Low-Cost Facility Design

When: Wednesday, June 17, 2015 from 2pm to 6pm

Where: Red Fire Farm, 184 Meadow Road, Montague MA 01351

This program will focus specifically on washing/packing facilities and low-tech & low-cost design for very small farms. Topics will also cover wash water sanitizer usage, sanitizer level monitoring, and other aspects of post-harvest handling using good agricultural practices for farm food safety.

To register, go to: https://www.surveymonkey.com/s/umassproducesafety

Contact Amanda Kinchla at amanda.kinchla@foodsci.umass.edu or 413.545.1017 for more info.

UMass Agricultural Field Day

When: Wednesday, June 24, 2015 9:30am-4pm

Where: UMass Crop and Animal Research and Education Center, 91 North River Rd, S. Deerfield, MA 01373

The public is invited to come and take a guided tour through the farm to learn about current research projects at UMass. Professors and graduate students will be on hand to offer presentations on a variety of research topics. Closed-toed shoes are mandatory. Sunscreen and hats are recommended. There is no registration fee; however, pre-registration is strongly encouraged. Lunch will be provided. Certified Crop Advisors will receive CEU credits: .5 credits for nutrient management and 2.5 credits for crop management.

Contact Kelly Kraemer at kkraemer@umass.edu or 413-545-5221 for more info.

2015 NOFA Summer Conference

When: Friday, August 14 to Sunday, August 16, 2015

Where: UMass Amherst Campus

This year's main conference features 144 individual sessions with 27 different topic areas. Workshops address organic farming, gardening, land care, draft animals, homesteading, sustainability, nutrition, food politics, activism, and more. The theme for this year's Conference is "Healing the Climate, Healing Ourselves: Regeneration through Microbiology" and will include sessions with UMass personnel:

- Amanda Brown, Director of the UMass Student Farm; Tour of the UMass Ag Learning Center
- Lisa McKeag, Extension Vegetable Program; Pest Scouting in the Field at Simple Gifts Farm
- Susan Scheufele, Extension Vegetable Program; Integrated Pest Management in Brassicas

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.